CLAIMS

1. A hollow guiding member (1) for guiding a surgical instrument (9) to a target presenting an outer surface, said target being preferably an anatomic organ (200) such as a beating heart or a liver, said guiding member (1) having a proximal portion (10) and a distal portion (11) and comprising:

- at its proximal portion, an elongated rigid body (2) having a first inner lumen;
- at its distal portion, flexible sealing means mounted on said body (2), for sealing said guiding member (1) on the outer surface of the target, said sealing means having a second inner lumen which communicates with the first inner lumen of the body (2);

the conformation of the guiding member (1) as a whole being such that a surgical instrument may pass through it.

2. The guiding member according to claim 1, wherein the body (2) comprises a distal end (23) and a proximal end (21), the distal end (23) being connected to the sealing means (3) and the proximal end (21) being connected via fixation means (6) to stabilisation means, said stabilisation means comprising immobile support means (7,8).

3. The guiding member according to claim 2, wherein said fixation means (6) correspond to a trocar.

4. The guiding member according to claim 2 or 3, wherein said stabilisation means comprise at least one support arm (7) attachable to a surgical table (8).

5. The guiding member according to any one of the preceding claims, wherein the sealing means correspond to a sucker (3), preferably of conical shape, having a top (31) and a base (30), the top (31) being narrower than the base (30) and being connected to the

distal end (23) of said body (2), said sealing means further comprising connection means (9) for connecting said sealing means (3) to an external negative pressure generator (5).

6. The guiding member according to any one of the preceding claims, further comprising a valve, preferably an homeostatic valve, disposed therein.

7. A method for performing a surgical intervention on a targeted anatomic organ, such as beating heart or a liver, using a surgical instrument, preferably a robotic surgical instrument, coupled to the guiding member according to any one of the preceding claims, said method comprising the following steps:

- coupling the guiding member (1) to fixation means such as a trocar (6);
- connecting the guiding member 1 to immobile support means (7,8) via said fixation means (6);
- connecting the sucker (3) of the guiding member (1) to an external negative pressure generator (5);
- creating a small incision in the patient's body (in the thoracic or abdominal wall).
- introducing the guiding member (1) by its distal portion (11) inside the patient's body through said incision until the surface of the targeted anatomic organ, while blocking said incision with the fixation means (6) so as to control the exchanges between the inside of the patient's body and the environment;
- placing the base (32) of the sucker (3) on the surface of the targeted anatomic organ and applying a low negative pressure generated by the sucker (3) of the guiding member (1) on said surface by means of the negative pressure generator (5) so as to stabilise the targeted anatomic organ;

- with the targeted anatomic organ thus stabilised, passing a surgical instrument (9) such as a robotic instrument, through the guiding member (1) so that one of its ends (90) protrudes outside the base (32) of the guiding member (1) and penetrates inside the targeted anatomic organ;
- pursuing the surgical procedure inside the targeted anatomic organ by intervening with the surgical instrument (9).

8. Use of the guiding member according to any one of claims 1 to 6 or the method according to claim 7, in cardiac surgery or in thoracic surgery.

9. Surgical instrument (51) adapted to cardiac surgery, and in particular to atrial defibrillation comprising insertion means for insertion inside the heart chamber (100), and cutting means (50) connected at a connection zone (540) to said insertion means, for creating lesions inside the heart chamber (100), said instrument (51) being such that both its translation and rotation movements are controlled by a robotic system (300) preferably coupled to a 3D-imaging system (400).

10. The instrument according to claim 9, wherein the insertion means correspond to a rigid elongated stem (52) delimited by an outer wall (521), with a main axis (A), and having a proximal end (523) and a distal end (522), said proximal end (523) being connected to the robotic system (300), while the distal end (522) is free.

11. The instrument according to claim 9 or 10, wherein the cutting means comprise a flexible spreadable support structure (510) with an inner surface (511) and an outer surface (512), and an electrode mesh or network (500,500',500'',...) arranged on the outer surface (512) of said support structure (510).

12. The instrument according to claim 11, wherein the spreadable support structure (510) corresponds to a dome structure having a tip (531) and a base (532), said base (532) being free and said tip being connected at the connection zone (540) to the outer wall (521) of the stem (52).

13. The instrument according to claim 12, wherein the dome structure (510) is subdivided into dome sections able to selectively adopt a rest configuration for which all the dome sections are folded up along the outer wall (521) of the stem (522) and a plurality of working configurations for which at least one dome section selectively spreads from the stem (52) according to a spreading angle (S) defined by the main axis (A) of the stem (52), the connection zone (540) and the base (521) of the dome structure (510).

14. The instrument according to claim 12, wherein the electrode mesh or network comprises a plurality of parallel electrodes (500,500',500'',...) arranged both radially and circularly on the outer surface (512) of said dome structure (510), and activable selectively by the robotic system (300).

15. Method for performing an atrial defibrillation using the instrument (51) according to any one of claims 9 to 14, comprising the following steps:

- making a small incision in the thoracic wall (80) of the patient so as to introduce guiding means (1) inside the patient's cavity until the outer surface of the heart chamber, whereon said guiding means (1) are placed;
- stabilising said guiding means (1) by attaching them to an immobile surface such as a surgical table (7);
- under the control of the robotic system (300), passing the instrument (51) through said guiding means (1) by

its distal end, with the dome structure (510) in rest configuration, until said instrument reaches the heart chamber and penetrates inside the heart chamber;

- positioning the instrument (51) inside the heart chamber relatively to the atrial wall and following a predefined sequence of translation and rotation movements of the stem (52) and of the dome structure (510) corresponding to a sequence of working configurations for the dome structure (510);
- coupling said sequence with a predefined activation sequence wherein different electrodes (500,500',500'',...) of the electrode network are selectively activated, so as to create selective lesions at precise locations in the atrial wall, said lesions being able to stop the electrical impulses associated to atrial fibrillation.

16. The method according to claim 15, wherein a surgical protocol is pre-established by taking a series of 3D images of the heart with the 3D-imaging system (400) and treating said images with the robotic system (300) so as to predefine the sequence of rotations and translations to give to the instrument (51) as well as the activation sequence of the electrodes (500,500',500'') in the electrode network.

17. The method according to claim 15 or 16, wherein the 3D-imaging system (400) coupled to the robotic system (300) takes a series of 3D-images as a function of time, preferably in real time, thereby allowing a monitoring of the surgical procedure.

18. Surgical instrument (81) adapted for hepatic surgery and comprising insertion means for insertion inside a target organ, and heating means for coagulating specific tissue regions inside said target organ, said heating means being connected to said insertion

means, said instrument (81) being capable of translation and rotation movements controlled by a robotic system preferably coupled to a 3D-imaging system and being adapted for intra-hepatic surgery.

19. The instrument according to claim 18, wherein the insertion means correspond to a rigid elongated rod (82) with a main axis (B), a centre of gravity (O), a proximal end (820) and a distal end (821), said proximal end (820) being connected to the robotic system, while the distal end (821) is free.

20. The instrument according to claim 18 or 19, wherein the heating means comprise at least (i) a secondary rigid rod (83) articulated on the main rod (82) via connection means (84) and provided with a main axis (B'), a proximal end (830) and a distal end (831), and (ii) at least one electrode (85,85',86,87) activable by the controlling means, preferably by radiofrequency.

21. The instrument according to claim 18 or 19, wherein the heating means comprise at least one bipolar electrode (87), articulated on the main rod (82) via connection means (84,84'), preferably consisting of one first needle (870) and a second needle (871), each of said needle (870,871) being defined by a main axis (B'',B'''), and activable by the controlling means, preferably by radiofrequency.

22. The instrument according to claim 20, comprising two primary monopolar electrodes (85,85') which are at least part of the secondary rod (83) and are activable selectively by the controlling means, preferably by radiofrequency.

23. The instrument according to any one of claims 20 to 22, further comprising at least one secondary monopolar electrode arranged at the distal end (821) of the

main rod (82) and activable selectively from said primary electrodes (85,85') or said bipolar electrode (87).

24. The instrument according to any one of claims 18 to 23, wherein the main rod (82) possesses six degrees of freedom, four of them being able to be blocked in operating conditions by the controlling means so as to allow only two degrees of freedom, one translation along and one rotation around its main axis (B).

25. The instrument according to any one of claims 18 to 24, wherein the secondary rod (83) has its main axis (B') parallel to the main axis of the main rod (82) and presents two degrees of freedom, one translation along and one rotation around its main axis (B') so that the height and the distance of the secondary rod (83) relatively to the main rod (82) can be adjusted by the controlling means, the distance being adjustable at a value varying from 0 to a maximum value.

26. The instrument according to any one of claims 18 to 25, wherein the bipolar electrode (87) presents different degrees of freedom, one rotation around their main axis (B'',B''') for each of said first and second needles (870,871) and one translation along said axis (B'',B''') so that the distance of the needles (870,871) relatively to the main rod (82) can be adjusted by the controlling means, said distance being adjustable at a value varying from 0 to a maximum value.

27. The instrument according any one of claims 18 to 26, said instrument (81) being able to adopt one rest configuration and at least one working configuration, each of said configurations being defined by a different relative position of the insertion means and/or the heating means, the instrument being not functional in rest configuration but being functional in working configuration.

28. The instrument according to claim 27, wherein when in rest configuration, the secondary rod (83) or the bipolar electrode (87) is folded up inside the main rod (82) (distance main rod (82)/secondary rod (83) or main rod (82)/bipolar electrode (87) equal to 0), and all the electrodes (85,85',86) are unactivated.

29. The instrument according to claim 27, wherein in a working configuration, the secondary rod (83) spreads out from the main rod (82), its main axis (B') being parallel to the one (B) of the main rod (82) and distanced to it of a certain distance greater than 0 and at least of the electrode (85,85',86) is activated.

30. The instrument according to claim 27, wherein in a working configuration, the bipolar electrode (87) spreads out from the main rod (82), the main axis (B'',B''') for each of said first and second needles (870,871) being parallel to the main axis (B) of the main rod (82) and distanced to it of a certain distance greater than 0 and at least of the electrode (87,86) is activated.

31. A method for coagulating an intra-hepatic tumour of a certain shape, using the instrument according to any one of claims 18 to 30, comprising the following steps:

- making a small incision in the abdominal wall of the patient so as to introduce guiding means inside the patient's cavity until the outer surface of the liver, whereon said guiding means are placed;
- stabilising said guiding means by attaching them to an immobile surface such as a surgical table;
- under the control of the robotic system, passing the instrument through said guiding means by its distal end, with the instrument in rest configuration, until said

instrument reaches the liver and penetrates inside the hepatic parenchyma;

- positioning the instrument inside the hepatic parenchyma relatively to the hepatic wall and following a predefined sequence of translation and rotation movements of the main rod and the secondary rod corresponding to a sequence of working configurations;
- coupling said sequence with a predefined activation sequence wherein different electrodes of the electrode network (first and second electrodes) are selectively activated, so as to lead to a tissue coagulation at precise target locations in the liver corresponding to tumour tissues.

32. The method according to claim 31, wherein a surgical protocol is pre-established by taking a series of 3D images of the liver and of the tumour with the 3D-imaging system and treating said images with the robotic system so as to predefine the sequence of rotations and translations to give to the instrument as well as the activation sequence of the electrodes in the electrode network.

33. The method according to claim 31, wherein the 3D-imaging system coupled to the robotic system takes a series of 3D-images as a function of time, preferably in real time, thereby allowing a monitoring of the surgical procedure.

34. Surgical assembly comprising a surgical instrument according to any one of claims 9 to 14 or a surgical instrument according to any one of claims 18 to 30, and controlling means for controlling said surgical instrument.

35. Surgical assembly comprising a guiding member according to any one of claims 1 to 8 and a surgical

instrument according to any one of claims 9 to 14 or a surgical instrument according to any one of claims 18 to 30.

36. Surgical assembly according to claim 35, further comprising controlling means for controlling said guiding member and said surgical instrument.

37. Use of the surgical instrument according to any one of claims 9 to 14 or the surgical instrument according to any one of claims 18 to 30.

38. Use of the surgical assembly according to any one of claims 34 to 36.